

# Solar Power Augmented Electrolysis Module for Energy Storage

Completed Technology Project (2013 - 2013)



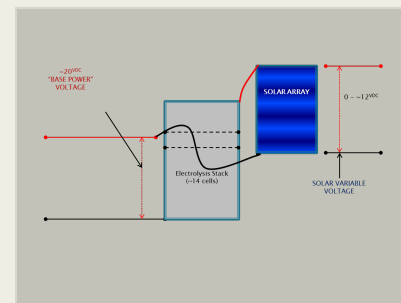
## Project Introduction

Integrating solar photovoltaic power with regenerative fuel cell systems for energy storage can often be very complex and costly. It usually requires complex power conversion and control interfaces matching the electrical performance of the constituent power providers and consumers with the real-time operational variations (sun or shadow side of orbit) and lifetime variations. We propose to investigate and demonstrate an alternate means of interfacing solar power to electrolysis modules that are part of base power systems. Will the results solve all of NASA's energy storage problems? No, but we will investigate a very simple, low-cost, power-following method of interfacing solar power to electrolysis modules in direct current (DC) energy storage systems (a regenerative fuel cell system is a DC energy storage system at the most basic level). We also see this as a building block technology for terrestrial micro-grid and off-grid energy storage systems.

Regenerative fuel cell systems often include a dedicated electrolysis module with solar photovoltaic (PV) panels packaged as a subsystem of the larger energy storage system. The voltage-current (V-I) performance curves associated with the system modules must be compatible—this often necessitates the use of complex electronic power control elements (DC-DC converters, DC-AC inverters, etc.). This proposal will investigate a power-following integration option for solar PV modules into DC base-power systems for dedicated electrolysis module operations without the need for DC power interface elements.

## Anticipated Benefits

This power control methodology will also have use with micro-grid and off-grid space systems, as well as future DC-power terrestrial base power systems.



Project Image Solar Power Augmented Electrolysis Module for Energy Storage

## Table of Contents

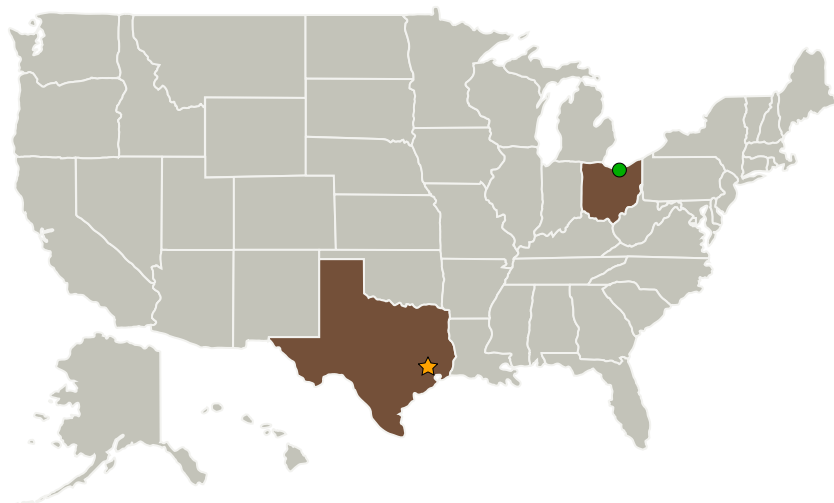
|  |   |
|--|---|
| Project Introduction                         | 1 |
| Anticipated Benefits                         | 1 |
| Primary U.S. Work Locations and Key Partners | 2 |
| Organizational Responsibility                | 2 |
| Project Management                           | 2 |
| Images                                       | 3 |
| Links  | 3 |
| Technology Maturity (TRL)                    | 3 |
| Technology Areas                             | 3 |

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## Primary U.S. Work Locations and Key Partners



| Organizations Performing Work | Role                    | Type        | Location        |
|-------------------------------|-------------------------|-------------|-----------------|
| ★ Johnson Space Center(JSC)   | Lead Organization       | NASA Center | Houston, Texas  |
| ● Glenn Research Center(GRC)  | Supporting Organization | NASA Center | Cleveland, Ohio |

## Primary U.S. Work Locations

|      |       |
|------|-------|
| Ohio | Texas |
|------|-------|

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Center / Facility:**

Johnson Space Center (JSC)

**Responsible Program:**

Center Innovation Fund: JSC CIF

## Project Management

**Program Director:**

Michael R Lapointe

**Program Manager:**

Carlos H Westhelle

**Project Manager:**

Abigail C Ryan

**Principal Investigator:**

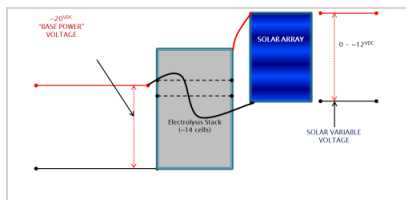
Abigail C Ryan

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## Images

**12128-1378506751599.png**

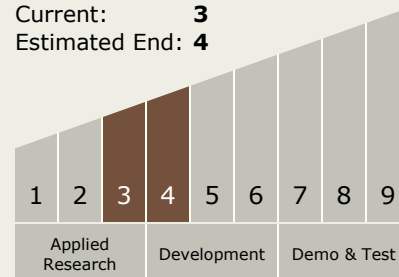
Project Image Solar Power  
Augmented Electrolysis Module for  
Energy Storage  
(<https://techport.nasa.gov/image/2268>)

## Links

NTR 1  
(no url provided)

## Technology Maturity (TRL)

Start: **3**  
Current: **3**  
Estimated End: **4**



## Technology Areas

## Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.2 Energy Storage
    - TX03.2.2 Electrochemical: Fuel Cells